

UH - Math 4377 - Dr. Heier - Spring 2010
HW 1 – due 01/28 at the beginning of class

1. Let $A = \{1, 2, 3\}$, $B = \{3, 4\}$. Write down all elements of the sets

$$A \cup B, A \cap B, A \setminus B, A \times A, A \times B.$$

2. Let $x, y \in \mathbb{Z}$. Let $x \sim y$ if and only if $4|y - x$. Prove that \sim is an equivalence relation.

3. Let $f : \{1, 2, 3, 4\} \rightarrow \mathbb{N}, n \mapsto n^2$.

(a) Find the domain, codomain and range of f .

(b) Is f one-to-one?

(c) Is f onto?

4. Let a, b be arbitrary elements in a field. Prove that $(-a) \cdot b = -(a \cdot b)$. (Hint: You may use without proof the fact that the additive inverse is unique.)

5. Let $z = 2 + 3i$, $w = 1 - i$. Write \bar{z} , $z + w$, zw , $|z|$, $\frac{1}{z}$ in the form $a + bi$.

6. Solve $x^2 - 4x + 13 = 0$ in \mathbb{C} .

7. Describe the plane in \mathbb{R}^3 through $(1, 2, 3)$, $(2, 0, 1)$, $(0, 1, 0)$.

8. **(extra credit)** Let $x, y \in \mathbb{Z}$. Let $x \sim y$ if and only if $5|y + 4x$. Prove that \sim is an equivalence relation.